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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/824.156	04/02/2001	James Broc Stirton	2000.071000	8997

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EXAMINER

VALENTIN, JUAN D

ART UNIT	PAPER NUMBER
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2877

DATE MAILED: 12/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<p align="center"><b>Office Action Summary</b></p>	<b>Application No.</b> 09/824,156	<b>Applicant(s)</b> STIRTON, JAMES BROC	
	<b>Examiner</b> Juan D Valentin II	<b>Art Unit</b> 2877	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 September 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-37 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \*    c) ☐ None of:  
         1. ☐ Certified copies of the priority documents have been received.  
         2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
         3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
     a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>7/03&amp;4/02</u> | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-37 rejected under 35 U.S.C. 103(a) as being unpatentable over Kotani (USPN '362) in view of Kleinknecht (USPN '123).

#### **Claim 1**

Kotani discloses a method comprising of providing a semiconductor substrate and forming a first plurality of implant regions (col. 1, lines 22-27) in the substrate. Kotani discloses generating a trace profile (film thickness measurement) corresponding to an implant profile of said implant regions (col. 3, line 57-col. 4, line 5). It is the position of the Office that the data accumulation area for determination of statistical results of the processes of Kotani is equivalent to the implant profile, and the trace profile as claimed by the applicant.

Kotani substantially teaches the claimed invention except that it fails to show illuminating a first plurality of implant regions with a light source. Kleinknecht shows that it is known to provide illumination of first plurality of implant regions with a light source (col. 3, lines 5-12) for semiconductor manufacturing. It would have been obvious to someone of ordinary skill in the art to combine the device of Kotani with the illumination of a plurality of

implant regions of Kleinknecht for the purposes of providing a means to measure the film thickness of a semiconductor substrate.

**Claims 2**

Kotani in view of Kleinknecht discloses a method further comprising generating an additional trace profile for an additional plurality of implant regions formed in said substrate or additional substrates. The said additional plurality of implant regions having an implant profile different from said first plurality of implant regions and further creating a library (database, Fig. 1, ref. 32) comprised of a plurality of calculated trace profiles of implant regions having varying implant profiles (Kotani, col. 3, line 57-col. 4, line 5). It would have been obvious to someone of ordinary skill in the art that in order to provide one or more profile characteristics to a processor, one or more profile characteristics must be generated.

**Claim 3**

Kotani in view of Kleinknecht discloses creating a library comprised of a plurality of calculated trace profiles of implant regions having varying implant profiles (col. 3, lines 57-66). It is obvious to someone of ordinary skill in the art that the database of Kotani comprises a plurality of calculated trace profiles of implant regions having varying implant profiles. Therefore, it is the position of the Office that the reference of Kotani in view of Kleinknecht reads on the claimed limitations.

**Claim 4**

Kotani substantially teaches the claimed invention except that it fails to show a method wherein the first plurality of implant regions in the substrate comprises forming a first plurality of implant regions to thereby define a grating structure in said substrate. Kleinknecht shows that

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it is known to provide a first plurality of implant regions to thereby define a grating structure in said substrate (abstract) for semiconductor manufacturing. It would have been obvious to someone of ordinary skill in the art to combine the device of Kotani with t plurality of implant regions to thereby define a grating structure of Kleinknecht for the purposes of providing a means to measure the concentration of carriers in a diffraction grating structure in a semiconductor substrate (abstract).

**Claim 5**

Kotani in view of Kleinknecht further discloses a method wherein said first plurality of implant regions are comprised of N-type dopant material or P-type dopant material. It is obvious and well known to someone of ordinary skill in the art that semiconductor substrates with implant regions or features are going to be doped with either a P-type or N-type dopant. Applicant is appreciated that the reference of Kotani in view of Kleinknecht reads upon the claimed limitations.

**Claim 6**

It is obvious to someone of ordinary skill in the art at the time of the claimed invention to illuminate the first plurality of implant regions using at least one of a multiple wavelength light source and a single wavelength light source. Applicant will be appreciated that the ref. Kotani in view of Kleinknecht reads on the claimed limitation.

**Claim 7**

Kotani in view of Kleinknecht further discloses a method wherein said implant profile is comprised of at least one of a width, a depth, a dopant concentration level, and a dopant concentration profile of said implant regions (col. 1, lines 22-33).

**Claim 8**

Kotani discloses a method of measuring profiles of implant regions formed in a semiconductor substrate comprising forming a plurality of implant regions in a semiconductor substrate (col. 1, lines 22-27). Kotani further discloses measuring a substrate to generate a profile trace for said implant regions and then comparing the generated profile trace to a target profile trace (col. 5, lines 14-57). Kotani further discloses modifying based upon a deviation between the generated profile trace and the target profile trace at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates. It is the position of the Office that the simulation and data acquisition areas of Kotani compare generated “profile traces” with “target profile” traces stored within the database are used to modify the process based on a deviation between the two.

Kotani substantially teaches the claimed invention except that it fails to show illuminating a first plurality of implant regions with a light source and measuring light reflected off the substrate. Kleinknecht shows that it is known to provide illumination of first plurality of implant regions with a light source (col. 2, line 67-col. 3, line 12) for semiconductor manufacturing. It would have been obvious to someone of ordinary skill in the art to combine the device of Kotani with the illumination of a plurality of implant regions of Kleinknecht for the purposes of providing a means to measure the concentration of carriers near the surface of a semiconductor substrate (Kleinknecht, col. 4, lines 32-35).

**Claim 9**

Kotani in view of Kleinknecht further disclose a method comprising correlating the generated profile trace to a profile trace from a library where the profile trace from the library

has an associated implant region profile (Kotani, col. 5, lines 14-57). It is obvious to someone of ordinary skill in the art that the process flows stored by Kotani are associated with an implant region profile based on a specific process flow to achieve that particular profile.

**Claim 10**

Kotani in view of Kleinknecht further discloses modifying based upon a deviation between the generated profile trace and the profile trace from the library, at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates (Kotani, col. 5, lines 14-57).

**Claims 11, 19, 27, & 34**

Kotani substantially teaches the claimed invention except that it fails to show wherein measuring the reflected light comprises measuring the intensity of the reflected light. Kleinknecht shows that it is known to provide measuring the intensity of the reflected light (col. 2, line 67-col. 3, line 12) for semiconductor manufacturing. It would have been obvious to someone of ordinary skill in the art to combine the device of Kotani with the measuring the intensity of the reflected light of Kleinknecht for the purposes of providing a means to measure the concentration of carriers near the surface of a semiconductor substrate (Kleinknecht, col. 4, lines 32-35).

**Claims 12 & 20**

Kotani in view of Kleinknecht further discloses a method comprising providing a library of calculated profiles traces, each of which correspond to a unique profile of an implanted region (Kotani, col. 5, lines 14-57). It is obvious to someone of ordinary skill in the art that the process

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flows stored by Kotani are associated with an implant region profile based on a specific process flow to achieve which ever desired unique profile.

Regarding the further limitation in claim 20, it is the position of the Office that even though the reference of Kotani in view of Kleinknecht does not specifically disclose providing a library of profile traces **in a library**, it does outline the importance of storing profile characteristics in a processor (database) (col. 11, line 41-63). In light of the applicants disclosure, there is no critically distinguishing providing a **library in a library** feature in the applicants disclosure that exemplifies novelty over prior art disclosure. Therefore producing the same results as the applicant's limitation, therefore the reference of Kotani in view of Kleinknecht reads on applicants claimed limitation.

**Claims 13, 14, 21, 22, 28, 29, 36, & 37**

Official notice taken. It is the position of the Office that it is obvious and well known to someone of ordinary skill in the art at the time of the claimed invention to anneal a semiconductor substrate during the manufacturing process, whether it be before or after an ion implantation process. This is evident because it is well known in the art to perform optical measuring processes to inspect manufactured devices several times during the manufacturing process in order to insure successful process conditions **throughout the entire** process.

**Claim 15, 23, & 30**

Kotani in view Kleinknecht discloses a method wherein modifying at least one parameter of an ion implant process comprises modifying at least one of an ion implant energy, an implant angle, a dopant material, and a dopant material concentration (col. 1, lines 22-33). It is obvious and well known to someone of ordinary skill in the art that during the fabrication process of



semiconductor devices, certain process parameters such as implant angles, dopant material and dopant material concentration among others are variable in order to quickly optimize production of the semiconductor devices. Therefore, Applicant will be appreciated that the reference of Kotani in view Kleinknecht reads on the applicants claimed limitations.

**Claim 16**

Kotani discloses a method of measuring profiles of implant regions formed in a semiconductor substrate comprising forming a plurality of implant regions in a semiconductor substrate (col. 1, lines 22-27). Kotani further discloses measuring the substrate to generate a profile trace for said implant regions and then comparing the generated profile trace to a target profile trace. Kotani discloses comparing the generated profile trace to a calculated profile trace in a library where the calculated profile trace has an associated implant region profile. Kotani further discloses modifying based upon said comparison of the generated profile trace and the calculated profile trace, at least one parameter of an ion implant process used to form implant regions on subsequently processed substrates (col. 5, lines 14-57). It is the position of the Office that the simulation and data acquisition areas of Kotani compare generated “profile traces” with “target profile” traces stored within the database are used to modify the process based on a deviation between the two.

Kotani substantially teaches the claimed invention except that it fails to show illuminating a first plurality of implant regions with a light source and measuring light reflected off the substrate. Kleinknecht shows that it is known to provide illumination of first plurality of implant regions with a light source (col. 2, line 67-col. 3, line 12) for semiconductor manufacturing. It would have been obvious to someone of ordinary skill in the art to combine

the device of Kotani with the illumination of a plurality of implant regions of Kleinknecht for the purposes of providing a means to measure the concentration of carriers near the surface of a semiconductor substrate (Kleinknecht, col. 4, lines 32-35).

**Claims 17, 18, & 26**

Kotani in view Kleinkecht discloses a method further comprising comparing the generated profile trace to a target profile trace from said library and modifying based upon a comparison of the generated profile trace and the target profile trace, at least one parameter of an ion implantation process used to form implant regions on subsequently processed substrates (col. 5, lines 14-57). It is the position of the Office that the simulation and data acquisition areas of Kotani compare generated “profile traces” with “target profile” traces stored within the database in order to monitor and modify the process throughout the manufacturing process.

**Claim 24**

Kotani discloses a method of measuring profiles of implant regions formed in a semiconductor substrate comprising forming a plurality of implant regions in a semiconductor substrate and illuminating said plurality of implant regions (col. 1, lines 22-27). Kotani further discloses measuring the substrate to generate a profile trace for said implant regions and then comparing the generated profile trace to a target profile trace. Kotani in view of Kleinknecht further discloses providing a library comprised of a plurality of calculated profiles traces, each of which correspond to a unique profile of an implanted region (col. 5, lines 14-57). It is obvious to someone of ordinary skill in the art that the storage of process flows of Kotani is the equivalent of providing a library and Applicant will be appreciated that the process flows of Kotani are of unique profiles of implanted regions. Kotani discloses comparing the generated profile trace to a

calculated profile trace in a library where the calculated profile trace has an associated implant region profile. Kotani further discloses modifying based upon said comparison of the generated profile trace and the calculated profile trace, at least one parameter of an ion implant process used to form implant regions on subsequently processed substrates (col. 5, lines 14-57). It is the position of the Office that the simulation and data acquisition areas of Kotani compare generated “profile traces” with “target profile” traces stored within the database are used to modify the process based on a deviation between the two.

Kotani substantially teaches the claimed invention except that it fails to show illuminating a first plurality of implant regions with a light source and measuring light reflected off the substrate. Kleinknecht shows that it is known to provide illumination of first plurality of implant regions with a light source (col. 2, line 67-col. 3, line 12) for semiconductor manufacturing. It would have been obvious to someone of ordinary skill in the art to combine the device of Kotani with the illumination of a plurality of implant regions of Kleinknecht for the purposes of providing a means to measure the concentration of carriers near the surface of a semiconductor substrate (Kleinknecht, col. 4, lines 32-35).

**Claim 25**

Kotani in view Kleinknecht discloses a method further comprising comparing the generated profile trace to a target profile trace (col. 5, lines 14-57). It is the position of the Office that the simulation and data acquisition areas of Kotani compare generated “profile traces” with “target profile” traces stored within the database in order to monitor and modify the process throughout the manufacturing process.

**Claim 31**

Kotani discloses a method of measuring profiles of implant regions formed in a semiconductor substrate comprising forming a plurality of implant regions in a semiconductor substrate and illuminating said plurality of implant regions (col. 1, lines 22-27). Kotani further discloses measuring the substrate to generate a profile trace for said implant regions and then comparing the generated profile trace to a target profile trace. Kotani further discloses modifying based upon said comparison of the generated profile trace and the calculated profile trace, at least one parameter of an ion implant process used to form implant regions on subsequently processed substrates (col. 5, lines 14-57). Kotani discloses at least one parameter comprises at least one of an ion implant energy, an implant angle, a dopant material, and a dopant material concentration (col. 1, lines 22-33). It is obvious and well known to someone of ordinary skill in the art that during the fabrication process of semiconductor devices, certain process parameters such as implant angles, dopant material and dopant material concentration among others are variable in order to quickly optimize production of the semiconductor devices. Therefore, applicant will be appreciated that the reference of Kotani reads on the applicants claimed limitations. It is the position of the Office that the simulation and data acquisition areas of Kotani compare generated "profile traces" with "target profile" traces stored within the database are used to modify the process based on a deviation between the two.

Kotani substantially teaches the claimed invention except that it fails to show illuminating a first plurality of implant regions with a light source and measuring light reflected off the substrate. Kleinknecht shows that it is known to provide illumination of first plurality of implant regions with a light source (col. 2, line 67-col. 3, line 12) for semiconductor

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manufacturing. It would have been obvious to someone of ordinary skill in the art to combine the device of Kotani with the illumination of a plurality of implant regions of Kleinknecht for the purposes of providing a means to measure the concentration of carriers near the surface of a semiconductor substrate (Kleinknecht, col. 4, lines 32-35).

**Claim 32**

Kotani in view Kleinknecht further discloses a method comprising comparing the generated profile trace to a calculated profile trace in a library where the calculated profile trace has an associated implant region profile (Kotani, col. 5, lines 14-57). It is the position of the Office that the simulation and data acquisition areas of Kotani compare generated “profile traces” with “target profile” traces stored within the database are used to modify the process based on a deviation between the two.

It is obvious to someone of ordinary skill in the art that if one or more profile characteristics are provided to a processor, then some form of library (database) must be created within the processor in order for the processor to compare the generated profile trace to known profile traces (col. 5, lines 14-57). Therefore, it is the position of the Office that the reference of Kotani in view of Kleinknecht reads on the claimed limitations.

**Claim 33**

Kotani in view Kleinknecht further discloses modifying based upon said comparison of the generated profile trace and the calculated profile trace, at least one parameter of an ion implant process used to form implant regions on subsequently processed substrates (col. 5, lines 14-57).

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**Claim 35**

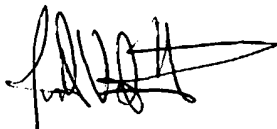
Kotani in view Kleinkecht further discloses a method comprising providing a library of historical profile traces, each of which correspond to a unique profile of an implanted region (col. 5, lines 14-57). It is the position of the Office that adding the further limitation of **historical** profile traces does not add patentable weight, therefore, the reference of Kotani in view Kleinkecht reads on the claimed limitations.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan D Valentin II whose telephone number is (703) 605-4226. The examiner can normally be reached on M-Th., Every other Fr..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank Font can be reached on (703) 308-4881. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308- 0955.



Juan D Valentin II  
Examiner 2877  
JDV  
December 3, 2003



Michael P. Stafira  
Primary Patent Examiner  
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